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The Use of Video-Tape Recording and Micro-Teaching Techniques to Improve Instruction on the Higher Education Level.

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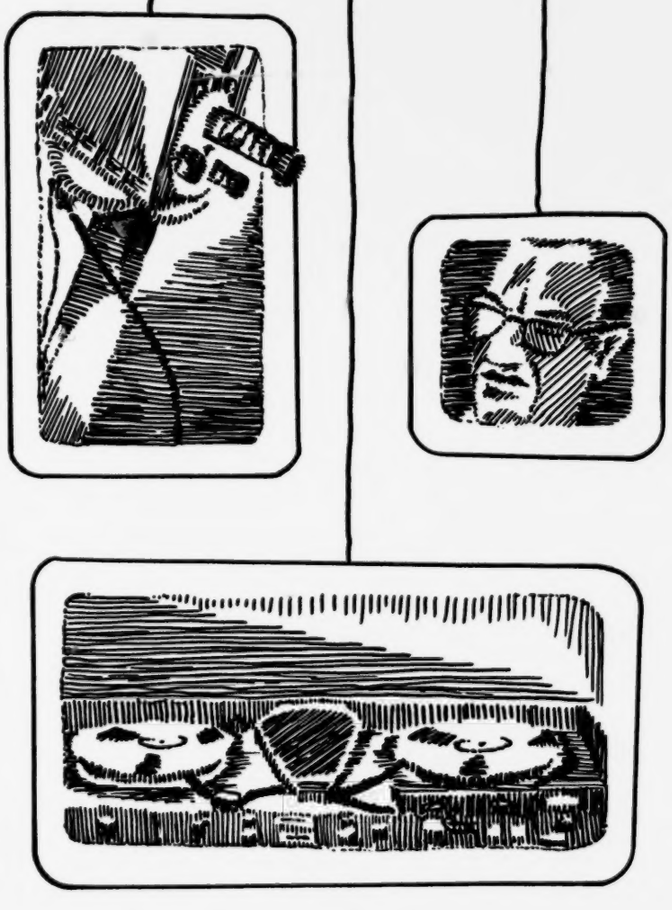
Video recordings provide an authentic feedback of classroom interaction, and microteaching a systematic method for analysis of these tapes and the acquisition of special teaching skills. Their combined use in teacher education has resulted in improved teacher-classroom interaction at the college level. The development of individual and group models motivates self-improvement in teaching strategy. Often, the psychological impact of self-confrontation causes a beneficial classroom behavioral change. Participatory attitudes, feedback mechanisms, and the feasibility of taping with portable equipment were examined in phase one of this study. In the second phase, tapes of engineering courses were analyzed. Senior and junior faculty members submitted to a minimum of six tapings during a semester with semi-professional equipment. Problems were encountered in the deployment of taping units and general logistics. Recommendations are that to reduce faculty anxiety, no administrative use should be made of the tapes without consent; that use of one-inch tape should be continued; and that taping and teaching activities should be coordinated. A list of equipment and a taping schedule are included. (TI)

A REPORT



on video-tape recordings
for improved teaching in higher education

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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THE USE OF VIDEO-TAPE RECORDING AND MICRO-TEACHING TECHNIQUES TO IMPROVE INSTRUCTION ON THE HIGHER EDUCATION LEVEL

DEPARTMENT OF GENERAL ENGINEERING
COLLEGE OF ENGINEERING

UNIVERSITY OF ILLINOIS
URBANA, ILLINOIS

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PREFACE

In recent years the Department of General Engineering has been involved in various activities and research projects designed to improve instruction. Student evaluation of teaching, using a special questionnaire developed by the department, is a regular activity at the end of each semester. A study of spatial perception is being conducted to develop an instrument for selecting freshmen students for homogeneous grouping and for use as a proficiency examination. Optimal uses of the overhead projector are being tested; evaluation of the present examination system and construction of new tests on a more scientific basis are being carried on. Several studies dealing with problems in technical education are being conducted. A relatively high number of faculty members are interested in these activities and several who are pursuing a doctoral degree in the College of Education intend to engage in educational research in the future.

Professor Jerry S. Dobrovolny, Department Head, has played a major role in developing a favorable climate in the department, which is essential to activities and research designed to improve engineering education. As a result of his interest and leadership in technical education, the department is conducting various year-round and summer programs for the preparation and improvement of teachers of technical education.

In the fall of 1965, Dr. Arye Perlberg, Head of the Teacher Training Department at the Technion-Israel Institute of Technology in Haifa, Israel, visited the University of Illinois as part of his study of vocational-technical education in the United States. He was then invited to spend his 1966-67 sabbatical year with the Vocational and Technical Education Department of the College of Education and the Department of General Engineering of the College of Engineering. This sabbatical year was extended through the 1967-68 academic year. During these years, Dr. Perlberg has pursued, in these departments, two projects exploring the uses of portable video recorders to improve instruction in: the University, a junior college, an area vocational school, and in the supervision of student teachers.

The following is a report of a study conducted in the Department of General Engineering, designed to explore ways to improve instruction on the higher education level through the use of video-tape recordings and micro-teaching techniques. David C. O'Bryant, Waldo D. Martin, and Walter H. Miller, Instructors in the Department of General Engineering and doctoral candidates in the College of Education, have collaborated with Arye Perlberg in pursuing the study. Karel H. Puffer, the Director of Vocational-Technical Education in Alberta, Canada, who was a doctoral candidate in Education during this year, served as the technical assistant to this study.

The authors of this report would like to thank their colleagues who have collaborated with them in pursuing this study, and Professor Jerry S. Dobrovolny who provided departmental funds and constant encouragement, without which this study could not have been conducted. The Provost of the University and the Dean of the College of Engineering were helpful by approving University funds for equipment and release time for the research team. The Director of the Office of Instructional Resources has provided encouragement and advice. Technical assistance was rendered by personnel of the University's television station, WILL.

Thanks also to Professor William D. Johnson, Director of the Teaching Technique Laboratory of the College of Education, who supplied us with equipment, technical help, and professional advice during the pilot study. He also facilitated some of our experimentation in the Teaching Technique Laboratory.

Last, but not least, the authors would like to thank faculty members and their students who participated in this study. Their cooperation and patience were the most essential factors in pursuing this study.

Arye Perlberg
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CHAPTER I

INTRODUCTION

Background

"The American college teacher is the only high-level professional man on the American scene who enters upon a career with neither the prerequisite trial of competence nor experience in the use of the tools of his profession."[1]

This statement, based on a report of a conference dealing with college and university teaching held in 1949, is also true today. There has been a growing verbal concern to correct this anomaly in higher education. However, relatively little has been done, in concrete action, through pre-service and in-service programs to improve teaching.

A recent issue of the Journal of Engineering Education[2] was devoted entirely to the problem of improving teaching in engineering education. Lancester,[3] reporting on the ASEE-Penn State Summer Institute on Effective Teaching for Engineering Teachers, states that engineering educators are probably more concerned over teaching effectiveness than any other group in higher education. Kroybill[4] traces a concern for effective teaching in engineering back to 130 years ago. He documents many programs as a testimony for this awareness.

In a letter to the editor of the same issue of the Journal of Engineering Education, two engineering educators discuss the problem of motivation for better teaching, and ask:

> What is to motivate the engineering educator to make the conscious and sustained expenditure of time and energy necessary to achieve significant improvement of his teaching ability? The slow progress in the improvement of engineering college teaching can be attributed in no small measure to lack of adequate reward.[5]

They admit that in some universities, recognition is given in various ways for excellence in teaching; however, "to motivate a significant improvement in college teaching, engineering educators must provide rewards which are competitive (per unit time invested) with the rewards for other types of academic activity," such as research, publication, and the seeking of grants and contracts. They insist that these rewards be important in the eyes of both academic administrators and engineering colleagues.

The situation is the same in other disciplines of higher education. In 1967, the American Council of Education sponsored a symposium on the problem of improving college teaching.[6] The consensus of opinion was that there are conflicting academic loyalties in higher education. However, it seems that many professors are not torn between these loyalties. They are clearly committed to research and consulting and view teaching as secondary and a tax they have to pay to pursue other activities in the university.

Wilson[7] suggests that teaching is not honored on the campus. He adapts Plato's observation, "what is honored in a country will be cultivated there," and says:

> If teaching is honored on our campuses, it will be cultivated there and will finally be done well there. If it does not find honor, expressed in the respect and prestige granted the teacher by his colleagues and by the dollars paid him by the comptroller, it is not likely to be cultivated nor to improve.

Most theories of learning emphasize the cardinal role of motivation in every effective learning process. There seems to be relatively little reward to motivate professors to engage in teaching improvement which is basically a learning process. On the contrary, the threat of being ridiculed or tagged as the "teacher" creates negative motivation towards teaching improvement. Nisbet[8] describes this feeling:

> The once familiar characterization of a faculty member as a good teacher but a poor research man is very likely to be fatal in the university today. Awareness of this had led many a naturally good young teacher to hide his light under a bushel lest he thereby run the risk of this currently invidious tag being applied to him. As one very candid assistant professor once put it to me in a letter: "I hope I never get labeled in any student or faculty evaluation as a good man with undergraduates. Until my research record is unchallengeable, I can get farther by dull teaching of undergraduates. This will at least leave open the possibility that my research promise may therefore be high."

Within the limits of this discussion, it is impossible to review in detail the voluminous literature on the subject. It is essential, however, to realize the true state of affairs if some effective positive action is to be carried out. The basic theme of this study is that presenting the professor with an accurate feedback of his teaching behavior might motivate change. The theme of this discussion is that a realistic bold look at the present attitude toward teaching in higher education is a prerequisite to any change.

In The Academic Revolution which was published very recently, Jencks and Riesman[9] discuss many of the issues presented in this report. They support, among other things, the view that there is no encouragement for good teaching in colleges and universities and state that:

> "Good teaching can be a positive handicap in attempting to meet other payrolls, especially in a place where most teaching is mediocre, for the able teacher finds students beating a path to his door and leaving him little time for anything else. If he is really committed to research, he may well find that the only way to make free time is to remain aloof...Many potential competent teachers do a conspicuously bad job in the classroom because they know that

> bad teaching is not penalized in any formal way. They have only a limited amount of time and energy and they know that in terms of professional standing and personal advancement it makes more sense to throw this into research than teaching."

The Problem and Purpose of the Study

There are many similarities between teaching in colleges and universities and other educational levels and it would seem logical to assume that many techniques used in teacher-education programs could be adopted in the process of improving teaching in higher education. However, traditional teacher-education programs have been sharply criticized, by outsiders and insiders in the profession, as being overloaded with abstract verbalism and therefore ineffective. Teachers in higher education were always hesitant to adopt some of these programs.

In recent years, intensive experimentation with the application of portable video-tape recorders and micro-teaching techniques in pre-service and in-service teacher education has resulted in significant improvement of teacher-classroom interaction. The video-tape recorders provide an authentic and most accurate feedback of classroom interaction. The micro-teaching technique provides a systematic method for the analysis of this feedback and for the modification of teacher behavior; thus, the main criticism of teacher-education programs not achieving a real change is greatly weakened.

The major purpose of this study was to develop strategies and to experiment with working models that would motivate faculty to engage in regular activities designed to improve the quality of their instruction. It was assumed that there was a need to adopt strategies and techniques that would motivate faculty members to pursue such activities in spite of the almost general nonsupportive and discouraging atmosphere surrounding activities of this nature.

The potential inherent in video-tape recorders and micro-teaching techniques seems to be unique. The self-confrontation with one's own behavior may create a measure of dissatisfaction with present modes of behavior and thus activate the need for self-fulfillment which, in this case, implies better teaching performance. It was hypothesized that the arousal of this inner need for self-improvement would be stronger than the surrounding nonsupportive forces. It was also hypothesized that systematic analysis of one's behavior and the opportunity to achieve a real change through the use of micro-teaching techniques would intensify the desire of the faculty to participate in such activities and would facilitate the desired change.

The Procedures

The study was carried out in two phases. In the first phase, a pilot study was conducted during the 1966-67 academic year. The purpose of this study was to explore the faculty's attitudes toward the use of video-tape recorders and micro-teaching techniques in activities designed to improve teaching and to identify working models and problems involved in the work.

In the second phase, a study was conducted during the 1967-68 academic year. A research team was formed. Three faculty members, doctoral candidates in technical education, were released from part of their duties to pursue research activities. The team was headed by a specialist in teacher education and one of the doctoral candidates. A research assistant was in charge of technical activities.

Two basic models were adopted for experimentation--the "individual" model (clinical) and a "group" model. A total of twelve faculty members, in all ranks, were involved in intensive work and four others explored the potential of this medium.

Research Methodology

The limited number of faculty members participating in this study, the voluntary nature of this activity, and the sensitivity of faculty to the video-taping process made it difficult to follow a research design of experimental and control groups that would yield statistically significant results. It was felt that this phase of the study should be devoted, among other things, to an exploration of the possibilities and conditions for the utilization of a more structured research design. Evaluation of this phase of the study was qualitative.

Technical Aspects

Equipment used in this project consisted of the following: one 1" Ampex video-tape recorder (7500), one Concord television camera with a tripod, one audio mixer with three microphones (two on stands and one lavaliere), and one 10" and one 23" monitor.

Some of the taping was done by a graduate assistant who controlled the camera, recorder, and audio mixer in the classroom. In other instances, the technical assistant controlled most of the equipment outside the classroom while a student helper controlled the camera in the classroom.

Structure of the Report

The first part of this report contains a theoretical discussion of the psychological problems inherent in the process of improving instruction in higher education and an analysis of the nature of video-tape recordings and micro-teaching techniques. This will be followed by a discussion of the study and its implications for future activities. A bibliography and appendixes containing some of the instruments used in this study are also included.

CHAPTER II

IMPROVING TEACHING IN HIGHER EDUCATION

Improving Teaching - A Process of Change and Re-education

The process of improving teaching in higher education is often oversimplified. Little consideration is given to the forces that influence the individual and the system in pursuing this objective. It would seem that many of the difficulties in achieving improvement are caused by this oversimplification and disregard for psychological complexities inherent in this process.

The term "improvement" is perceived by those who advocate it as having a positive connotation. To avoid any bad feeling, it is often said "there is always room for improvement." But the teacher who is advised to improve his teaching usually perceives the negative connotation of this advice and the implied inadequacy of his present way of teaching. Admitting inadequacies requires him to change and modify his teaching behavior. In pursuing such an activity, he is confronted with internal and external forces that may facilitate or hamper this process. What are these forces?

Modifying teaching behavior requires an investment of time and energy. The results and reactions to the changes are in many instances unknown and create anxieties and emotional stress that in turn create resistance or ambivalent feelings toward change. But even if a conscientious professor succeeds in overcoming his anxieties, he faces external forces in all levels of the academic world. Do these forces facilitate change? Do they reward the improvement of teaching? Is the climate conducive to activities of this kind?

In viewing improvement of teaching as a process of change, it would be valuable to adopt Lewin's concept of change. He views change as a re-educative process and differentiates between three types of change.[10]

> Re-educative process affects the individual in three ways. It changes his cognitive structure, the way he sees the physical and social worlds, including all his facts, concepts, beliefs, and expectations. It modifies his valences and values, and these embrace both his attractions and aversions to groups and group standards, his feelings in regard to status differences, and his reactions to sources of approval or disapproval. And it affects motoric action, involving the degree of the individual's control over his physical and social movements.

Later in his discussion,[11] Lewin suggests that the re-educative process frequently reaches only the formal system of values, the level of verbal and emotional expression but not behavior. He warns that it may heighten the discrepancy between the super-ego (the way I ought to feel and behave) and the ego (the way I actually feel and behave) and thus develop in the individual guilt feelings and a bad conscience which may lead to high emotional tension.

Applying Lewin's categories of change to an evaluation of the present efforts to improve teaching in higher education, it would seem that a cognitive change has been achieved to a great extent in this area. The growing amount of literature on the subject, the popularization of the problems through mass media communication in which the concepts of "publish or perish" or neglect of undergraduate education have been focused, has brought focus on a new dimension. There is also a growing attitudinal change, especially among academic administrators who are ready to admit that, as Goheen,[12] the president of Princeton, has said:

> In the college or university, research and teaching are two poles of the same magnet; neither has much force without the other. That is what the ideal of the teacher-scholar is all about.

But, Goheen continues and states that, unfortunately, in higher education today, "the emphasis and glamour (is) now widely and strongly attached to research."

The real problem lies in achieving effective behavioral change in the classroom. The dual verbal loyalty to both research and teaching, and the one-sided practical loyalty to research only, does not enhance a behavioral change. Moreover, it would seem that in the present range of activities, such as seminars or symposiums on teaching problems, the emphasis is on cognitive and attitudinal change. Much less is reported in the literature on activities that aim to achieve visible changes in teachers' behavior. In this respect, there is a replication of many of the inadequacies of present teacher-education programs for secondary and elementary teachers[13] that tends to emphasize the verbal attitudinal change rather than the behavioral.

A faculty member who has participated (on a national level or in his own institution) in activities designed to improve teaching and who is convinced of their importance, but who does not know how to or is not able to implement them, confronts psychological pressure that may lead to constant guilt feelings, frustration, or cynicism. It is essential, therefore, that the gap between the verbal encouragement to improve teaching and the actual means to achieve it be narrowed. Activities to improve teaching should focus on ways and means by which the teacher could modify his own classroom interaction and derive from it personal satisfaction that will counteract outside negative attitudes.

The discussion above has focused on the problems that may result from intensified internal conflicts. However, a certain amount of conflict is essential in order to achieve change. Miel[14] capitalizes on the importance of utilizing a feeling of dissatisfaction with existing conditions. The problem is how to achieve an optimal measure of dissatisfaction. When dissatisfaction is created, the problem is to assist the teacher in adopting a teaching style which will suit his needs. It is necessary to present some models[15] of patterns of teaching to follow, or some other professional advice about improvement is essential.

Unfortunately, in spite of efforts of educational researchers, knowledge of teaching-learning processes is yet limited. This is especially true on the higher education level. In many instances, teachers in the scientific and technological disciplines view the inadequacy of educational research in supplying data on the

effectiveness of some teaching techniques as a defense mechanism or a legitimate reason to refrain from experimentation with new ideas. There are, however, research findings which could provide some direction.

McKeachee,[16] in his survey of research in teaching and its implication for higher education, has cited a significant number of areas where teachers in higher education could rely on research results and adopt certain styles of teaching to achieve specific objectives in higher education. For example, if the purpose of an engineering school, in addition to transmission of information, is to develop concepts, problem-solving skills, creativity, curiosity, and the ability to communicate ideas, then classroom discussion, which was found to be more effective than lecture in achieving these goals, should have a much greater role than it has today. To reach this goal, teachers must acquire the skill of effective discussion leadership and questioning technique.

The use of portable video-tape recorders and micro-teaching techniques seems to provide some solutions to the problems discussed above and offers new opportunities for the improvement of teaching in higher education. The simulation and feedback of classroom situations through these media and techniques provide content for analysis and discussion of a teacher's classroom interaction and performance at a level of precision and actuality that has never before been possible.[17]

The following is a discussion of the nature of these new media and techniques and their relevance to the improvement of teaching processes. A bibliography on micro-teaching, feedback mechanisms, and related areas is included in the appendix. It should be emphasized that research data cited are drawn from the general field of research on teaching. The absence of research in higher education in these areas requires reliance on applicable data from other fields.

CHAPTER III

FEEDBACK MECHANISMS AND THE MICRO-TEACHING TECHNIQUE

Feedback Facilitates Change

The importance of adequate feedback of a professor's behavior can not be emphasized more strongly. Feedback facilitates the analysis and comparison of the professor's behavior with generally accepted criteria and behavioral objectives. It reinforces acceptable behavioral patterns and creates dissatisfaction with undesirable patterns. It is instrumental in establishing new behavioral objectives for the individual teacher and can verify whether they are attained. Thus, adequate feedback may motivate and facilitate the modification of the professor's behavior.

Systematic Observation Methods

Traditionally, classroom interaction was described in vague terms by teachers and researchers alike. A better understanding of this complex phenomena has been gained in recent years with the development of various methods of observing, analyzing, and measuring classroom behavior. Medley and Mitzel[18] describe a number of systems designed to measure classroom behavior (the teacher's and the students') by systematic observation. Many of the systems reported have since been modified and sophisticated through extensive research. The growing interest in research studies on observational systems to study teacher behavior is manifested in the large number of articles in the literature and the research papers presented in recent conventions (1967 and 1968) of the American Educational Research Association.

The serious limitation of systematic observation methods is that they are based on the observation and written recording of someone whose perception and mental image may be impaired by variables such as perceptual distortion and attention limitation resulting from intrinsic factors or disturbances in the classroom. Personal biases and memory lapses also contribute to distortion.

The use of audio tape to record classroom activities permits repeated analysis of classroom interaction by several people, thus removing some of the personal distortion. It also enables the teacher involved to analyze his own activities. However, both live and audio systematic observation methods are limited to verbal interaction in the classroom and eliminate many essential nonverbal variables inherent in classroom interaction. It is possible that many teachers reject a proposed modification of their classroom behavior on the analysis of verbal interaction alone since it does not provide the "whole picture" of what really occurs in the classroom.

Self-Confrontation Through Video Recorders

The introduction of portable video-tape recorders permits the recording of events in the classroom with minimum disturbance to the professor and students.

Relatively inexpensive facilities, using two cameras, permit simultaneous recording of the professor's and students' activities. Both pictures (split screen) are projected by the recorded tape and a greater understanding of classroom interaction can be achieved.

Video recording is not new and a number of professors have been taped in the past, for the most part in TV studios, and in a few cases in their classrooms. But taping of classroom activities in a studio has turned the lesson into a performance in many cases. Taping in regular classrooms with professional, cumbersome television equipment has also disrupted the atmosphere of the classroom and distorted the real image of the professor-student interaction.

The relatively inexpensive technological innovation of portable video recorders provides an instant, accurate feedback of classroom interaction as a whole (verbal and nonverbal) in the professor's natural habitat, his classroom. It provides a basis for reliable analysis and decisions about desirable modification in classroom behavior.

The Psychological Impact of Video Recordings

Teachers, like all human beings, have ambivalent feelings towards a feedback mechanism. Though it provides them with the sense of direction essential for the continuation of any activity, it may require them to change and modify behavior, which at times creates uncertainty, discomfort, and even anxiety.

In contrast to teachers on the secondary and elementary level, teachers in higher education regard their classrooms as their "castles." Any uninvited visit of an observer, whether an administrator or a researcher, may be viewed as invasion of privacy and academic freedom. The sensitivity of many professors in this matter even discourages colleagues from requesting permission to observe. Teaching assistants, who are supposed to be supervised by their superiors, also enjoy, in many instances, the "privilege" of not being visited by persons in authority. A decision to retain them on the faculty is based many times on word of mouth rather than direct observation.

When they grant permission for observation, professors are able to rationalize about unpleasant feedback of their classroom behavior by stating that it is inaccurate and subjective and even distorted by the observer. In many cases, they fail to remember many things that were seen and reported by the observer. These defense mechanisms are instrumental in relieving them of anxieties involved in facing the truth.

An entirely different situation has arisen with the utilization of portable video recorders. Now the feedback can be accurate; defense mechanisms previously employed will not work. Reality in its nakedness is available to the professor. It has been said that what the professor needs now is "a desire to confront himself and courage to accept what he sees."

The professor's ambivalent feeling toward viewing his image is evidenced also in feelings of interest and curiosity. There is a certain fascination in seeing one's

own image; it is the magic of the mirror; the visual echo.[19] This narcissistic fascination, coupled with admiration and wonder for the technological phenomena in which his image is recorded and played back instantly, increases his curiosity and motivates him to take the chance and look at himself at least once. Some regret this self-confrontation and refuse to participate any more in such activities. Others become highly motivated to continue.

Once the professor overcomes his initial anxieties of observing himself, it would seem that there would be nothing more convincing to him than the true picture of his classroom interaction. When used properly, it is hypothesized that this traumatic experience of self-confrontation can greatly enhance the professor's readiness for change.

Schueler and Lesser (1967) have documented a number of studies in which video-tape was used as a feedback mechanism to modify behavior in teacher-education programs and the closely allied fields such as counselor training. They cast some doubt on the effectiveness of this media in teacher supervision.[20] Since Schueler and Lesser published their findings, there have been reports[21] which indicate the effectiveness of feedback in producing change. Nevertheless, there is a need for further research to verify the optimal uses and conditions for modifying teacher behavior through video-tape recordings.

Micro-Teaching Techniques

Micro-teaching[22] is a teaching encounter scaled down in class size and time. Micro-class size is usually three to six students and includes a five- to twenty-minute lesson. The purpose of micro-teaching is to provide prospective student teachers with a substantial amount of actual teaching practice preceding their entrance into student teaching in their assigned school. This is done with optimum control and evaluation procedures without jeopardizing the learning of regular classroom pupils. The micro-teaching process takes place usually in "teaching laboratories." The student teaches micro-lessons to micro-groups, practicing mainly with a specific skill for each lesson, such as the ability to lecture, ask questions, lead a discussion, demonstrate, etc.

The lesson is taped and the student teacher views the tape immediately after the presentation. He analyzes his performance with the aid of a supervisor's critique and written feedback on an evaluation questionnaire completed by the students in the laboratory classroom. In some cases, he plans an "improved" version of the same lesson and re-teaches it immediately to another micro-laboratory class. In other cases, he will re-teach the lesson after a few days.

Since its inception, the micro-teaching model has been modified in many ways. Even though experimentation at Stanford University has already yielded positive results, the originators have indicated the need for further exploration to find optimal models for the use of micro-teaching in teacher education.[23]

Educational researchers have experimented with modified models of the micro-teaching technique or combinations of micro-teaching and systematic observational methods. The most common combination is probably micro-teaching and interaction analysis.[24]

Micro-teaching has been used at universities and educational institutions across the country, not only in pre-service teacher education and as a research tool to explore training effects under controlled conditions, but also as a tool for experienced teachers to gain more complete knowledge about their interaction with students for the purpose of analyzing this feedback in a relatively systematic way. In his discussion of the various uses of micro-teaching, Allen[25] states that experienced teachers can gain insight through the use of micro-teaching techniques. They are able to attempt approaches to the teaching of a particular subject without the risk of failure in the regular classroom. The video feedback of the actual performance, coupled with a systematic analysis of classroom interaction, provides an effective stimulus for the improvement of teacher performance. This is true not only for young, inexperienced teachers but also for the experienced, relatively effective teachers who have reached a plateau and need a strong stimulus to motivate teaching improvement.

Many of the advantages of micro-teaching techniques and portable video recorders seem logical; however, much research is needed to prove their validity and to propose optimal uses to maximize teacher effectiveness. Research reports on the use of micro-teaching techniques in higher education are limited to one restricted experience in engineering education. Reports of similar attempts have been communicated to the researcher. Though conditions in higher education differ from those in teacher education or regular schools, there are some common elements. Experiences with micro-teaching in this study seem to indicate that micro-teaching can be instrumental in improving teaching.

CHAPTER IV

THE USE OF VIDEO-TAPE RECORDERS AND MICRO-TEACHING TECHNIQUES IN THE DEPARTMENT OF GENERAL ENGINEERING

THE 1966-67 PILOT STUDY

Description of Activities

During the 1966-67 academic year a pilot experiment with portable video-tape recorders for instructional feedback purposes was conducted. The first phase began during the fall semester. Faculty members were offered the opportunity to be taped in their regular classrooms and were advised that they could ask for a critical analysis from some of their colleagues or a teaching methods expert. Several faculty members (ranging from professor to assistant) volunteered to participate in the experiment.

The purposes of this phase were: 1) to ascertain the attitudes and behavior of the faculty and students during the taping; 2) to identify the problems involved in the analysis of tapes and to examine various methods of utilization of this feedback mechanism; and 3) to explore the feasibility of taping with portable equipment in a regular classroom and to identify the technical problems involved.

The taping during this phase was done by students who had operated similar equipment in the College of Education micro-teaching project. Equipment was obtained from the College of Education.

At the end of this phase, the participants expressed their reactions to video-taping in an attitude questionnaire. In general, their attitudes toward the experiment were positive. Participants agreed that it would be advisable to continue experimentation with this media on a more regular and structured basis.

For the second phase during the spring semester, a more structured activity was designed. Three instructors who taught the G.E. 103 course, Engineering Graphics, agreed to participate. They were selected from a list of those who volunteered to participate in the experiment. The criteria for the selection was the rating of their instruction by students (low, medium, and high). Each one was taped six times, thirty minutes each time. In addition, five lectures of a professor in a course in the History of Engineering were taped. The taping during the second phase was done with more expensive equipment and operated by a team of WILL Television Studio technicians and a director.

Results of the Pilot Study

Most of the important results of the pilot study are incorporated in the final discussion of this report. However, at this point, it is essential to mention three conclusions that were central to the design of the major study.

1. Activities during the pilot study generated sufficient interest by the faculty, on the problem of improving their teaching, to merit the continuation of this study in a more structured design.

2. Activities in this area required a substantial amount of time. It was suggested that faculty members involved in these activities be released from other duties in order to develop strategies and models to pursue this work intensively.

3. Taping activities in the second semester were done by a team of professional technicians and some professional equipment, which added greatly to the cost of the activity. Experience has shown that with non-professional equipment and student help it is possible to produce tapes of adequate quality for analysis purposes.

THE 1967-68 STUDY

The Purpose

The purpose of this study was to evaluate the effectiveness of certain models for the use of video recordings and micro-teaching techniques to improve instruction in higher education. The two models adopted were an "individual" model and a "group" model.

Description of Activities and Results

The individual model was designed to explore patterns of "helping relationships" between senior faculty members and an educational consultant. To pursue this exploration during the first semester, a professor who had participated in the pilot study was chosen. Being a full professor, his primary motivation was the improvement of instruction.

The course taught by the professor was History of Engineering, a subject that lent itself to student involvement in discussions, critical analysis of technological developments and synthesis of their humanistic and scientific attributes. The course was taught three times a week and was divided into two sections of approximately twenty students each. The rationale for teaching the same subject twice a day to two small groups was that the professor preferred class discussion to lecture, and this could be done only in small groups.

The analysis of tapes that was made during the pilot study revealed to the professor that his style of teaching was lecture-centered, in contrast to his stated intentions. When there was involvement, it was mainly lower-order questions, such as "who" and "when." It was evident that much of what was presented in the lecture was found in the textbook. This style has been the pattern of teaching of this subject for many years by many professors.

Deliberation between the professor and his consultant touched upon topics such as: goals of college education in general and engineering education in particular; the objectives and uniqueness of the course "History of Engineering" in the engineering curriculum; styles and methods of teaching; and the physical arrangement of

the classroom to promote learning. As a result of these discussions, the following course of action was proposed.

1. Assuming that the professor likes student involvement and that the course offers opportunities for such involvement, the utilization of video recording and micro-teaching techniques should focus on modifying the style of teaching from "lecture-centered" to "classroom interaction."

2. The professor should acquaint himself with literature on discussion and questioning techniques.

3. The students should be informed at the beginning of the semester that they will be expected to read in advance the textbook material to be covered in each session. They will be assigned specific analytical questions for classroom discussion which will be the main teaching method of the course. Enrichment lectures of material not found in the text will be given from time to time. The class will be divided frequently into subgroups for the purpose of group presentations and group projects.

4. The bolted chairs in the classroom should be unbolted and arranged in a semicircle. The professor should move into the semicircle rather than teaching from his desk.

5. Classes will be taped approximately once a week with an analysis of the tape following that class period.

6. These activities will be carried out only in one section. In the other section, teaching will continue as in the past.

The above-mentioned activities were carried out as proposed. After analysis of the first tape, it was decided to concentrate on developing proficiency in the questioning technique. For this purpose, the professor taught two micro-lessons in the micro-teaching laboratory of the College of Education. In the analysis of the taped sessions, attention was focused on different aspects of questioning, such as, high-order questioning involving introverted or timid students, calming down extroverts and those who monopolize the discussion, and encouragement of student questions.

Visible achievement in questioning technique has shifted the emphasis to acquiring proficiency in discussion leadership and sensitivity to nonverbal communication. The professor practiced some of these skills on micro-classes.

Evaluation of tapes by the research team, live observation in the classroom, and discussion by the researcher with the students indicate a visible change in the style of teaching. Students indicated a high degree of satisfaction from a course

that enabled them to think and express their thoughts. They were impressed by the general efforts of the professor and the department to improve teaching. They felt that many courses in the technical and scientific subjects could also be taught with various degrees of increased student involvement. They cited several examples where this is done. They added that unfortunately many courses in liberal arts that call for classroom interaction are lecture-centered, and even in small discussion groups, graduate assistants tend to give their version of the professor's lecture.

The professor expressed great satisfaction from the activities; a strong Hawthorne Effect developed. The visible change in each lesson and student cooperation led to greater readiness and efforts to participate and follow the consultant's advice. It is interesting to note that the professor has shared his experience with his wife, who has helped analyze his audio tape and witnessed him practicing nonverbal communication techniques at home.

Even though research activities were designed for one section, without consulting the research staff, the professor tried the new style also in the control section. This section preceded the experimental one and it became unintentionally a testing ground for the professor. He admitted later that once he was dissatisfied with his previous teaching style, he could not continue it in the control group. It was impossible to hide the taping and other activities of the experimental group from the control group. They too became highly motivated to prove that they "could interact even without being taped." The researchers decided at that point that there was no way to control the situation and any criticism of the professor or imposition of a strict research design would inhibit the process of change in the experimental group.

It is significant to note that the professor was also involved in church group leadership activities. He saw the immediate application of the new techniques to these activities. The successful application of discussion leadership methods in his church activities has augmented his high degree of cooperation.

During the second semester, the professor did not participate in any of the research activities. However, observations of his classes (without taping) indicated a high degree of persistence and improvement of the newly adopted techniques. At one point, the professor commented: "I have another ten years until retirement, and I found a new zest in life." Another professor was also taped during this semester and has indicated interest in pursuing intensive work.

During the second semester, the researchers approached a group of faculty members who belonged to one of the departmental divisions and who taught similar subjects. The Evaluation of Instruction Questionnaire administered by the department indicated certain teaching shortcomings within this group. It was hypothesized that one of the reasons for the lack of high ratings was inherent in the specific subject matter and/or the absence of adequate textbooks. The group recognized, however, that some of the problems could have been caused by style and teaching methods. They agreed to be taped in classes and engage in an analysis of the tapes to identify teaching behavior that needed to be modified. Members of the group who participated intensively were taped on the average of five times during the semester. The following is a description of work with one of these professors.

The class consisted of ten students in a course on engineering design. In preliminary discussions, the professor concurred that the nature of the course, problem solving, and the size of the group demanded classroom interaction. From the first tape, it was evident that there was not enough interaction and that the course was "professor-centered." New subject matter was presented, mainly by a lecture method using, from time to time, illustrated visual aids (models, charts, slides). Selected problems were solved on the blackboard mainly by the professor. Occasionally, students were also involved in solving homework problems at the blackboard. When questions were asked, a few students volunteered answers, while the rest remained passive.

After analysis of the first tape, it was decided to focus attention on increasing classroom interaction. The following steps were planned:

1. Increase the ratio of questions and student interaction in relation to the lecture.

2. Ask more probing questions and involve all students. Since those who do not participate tend to sit in the back of the room, ask them to exchange seats.

3. Have a group of students solve problems out of class and present them to the class using transparencies and the overhead projector. Show the students a tape of the presentation and ask the class to critique it.

4. Involve students in a discussion and focus attention on nonverbal communication.

The above-mentioned goals were determined one at a time after the weekly analysis of a tape. During the discussion, the researcher reinforced the professor by pointing out good features in each lesson.

In addition to the video feedback, it was decided that students should evaluate each lesson. This was done through a micro-teaching evaluation instrument developed by the Teaching Technique Laboratory of the College of Education. (See appendix.)

In general, the lessons were highly rated. Problem areas indicated by students on the rating forms correlated with the analysis of the tape by the professor and consultant. This reinforced the professor's decision to proceed with the suggested modifications of teaching style. When tapes of the last two lessons were reviewed by students, they expressed favorable attitudes toward the entire project. Similar work on other teaching skills such as lecturing techniques, effective use of audio-visual aids, varying the stimulus in the classroom and reinforcement techniques were emphasized during individual work with other faculty members of this group.

In an evaluation discussion, many faculty members, belonging to the group in which intensive work was carried out, became convinced of the value of the project activities and some expressed a desire to be taped regularly next year in order to systematically examine their teaching effectiveness.

The group model was designed for assistants teaching engineering graphics. For a number of years, new staff members teaching this course have attended an in-service training program on a weekly basis. This program dealt primarily with subject matter, although pedagogy problems were discussed where appropriate. During the fall semester the program was expanded to two meetings weekly with one session devoted entirely to teaching methods using the video-tape equipment.

The rationale for experimenting with the group model was that even though people may be anxious and apprehensive about being taped and analyzed in a group, they can still benefit from analyzing each other's problems, especially when they are new assistants teaching the same subject matter. It was assumed that being involved in a weekly seminar on teaching problems would reduce the tension resulting from group analysis of tape. It was also suggested that the problem of improving teaching in higher education could not be solved through individual work only and that there was a need to explore group models, which are more economical and feasible, in view of the limited number of experts available for consultation on such matters.

During the fall of 1967, four new assistants were taped, and members of the research team, who taught the same course, were also taped. The first six sessions were devoted to group analysis of individual members. After viewing the tape, the individual involved would critique himself. Members of the group and the researchers would add comments and suggestions for improvement. The tapes of lessons taught by members of the research team were also critiqued. During the latter part of the semester, some of the assistants asked for individual work and were assigned to members of the research team for intensive work on problems unique to each of them.

In addition to the individual work, the group started to experiment with micro-teaching lessons. Each assistant prepared a twenty-minute lesson on subject matter to be taught the subsequent week. The assistants were able to experiment with a sequence they would be teaching the following week. The lesson was taught to a group of five paid learners. The learners, the assistant's colleagues, and members of the research team evaluated each lesson using a micro-teaching evaluation instrument. The assistant and the group reviewed the tape and analyzed the lesson on the basis of the tape feedback and the written feedback.

The assistants and the research team were in general agreement regarding many of the benefits of the program. They stated that the taping and critiquing were instrumental in helping them to reach a higher level of confidence and proficiency in the classroom. They felt that the program should be continued and expanded to other areas where graduate assistants were used. In all, sixteen faculty members were involved in the project; some in intensive work and others in exploring the possibilities of this media and technique to improve their teaching. Most indicated readiness to pursue such work next year.

It was felt that, while the equipment and research staff were available to the department, exploration of additional activities should be pursued. Video-taping was used as a feedback mechanism in G.E. 291, the senior seminar, for the student presentations of final papers. The students were able to receive an effective feedback and critique of their presentation from their instructor. Students, attending an Academic Year Institute, enrolled in G.E. 393, seminars in technical education, were also taped and critiqued during presentation of technical subject matter. They were teachers in technical programs of junior colleges.

RESULTS AND DISCUSSION

Attitudes of Faculty and Students

The successful introduction of the innovations described in this project required a supportive atmosphere and the cooperation of faculty, administration, and students. To achieve such an atmosphere and cooperation, general dynamics of introducing innovation to a system and specific psychological barriers related to the introduction of these media and techniques must be considered.

Miles[26] states that "other things being equal, innovations which are perceived as threats to existing practices rather than mere additions to it are less likely to be accepted." In this project, both innovations may be perceived as threats; moreover, their intended purpose is to facilitate change in the existing practices of the people involved.

The attitudes of the faculty were, in general, favorable. Those able to overcome initial anxieties participated intensively in taping and analysis and have modified some of their teaching practices. The general supportive atmosphere of the department to activities in the area of teaching improvement, and especially the five-year experience with student-written evaluation each semester, was probably a major factor.

These evaluations have probably contributed to readiness in two ways. Faculty members who regarded the evaluation procedure as a desirable feedback viewed the video-taping as a supplementary and more effective media with which to analyze themselves. Those who had ambivalent feelings, or who questioned the value of student evaluations, saw in the taping a "real" and "authentic" feedback with which to analyze their own behavior. Some who had received low student ratings hoped to see on the tape high-quality teaching that would counterbalance the students' evaluations.

Everyone who went through the procedure expressed some degree of anxiety about self-confrontation. In one case, a professor commented after viewing his tape, "Gosh, this is the first time I have seen myself as others see me. I did not realize I was so boring." Another professor viewed himself and said, "I am not interested in more taping. This is the first and the last time."

Between the two extremes, one who was ready to be a missionary to the idea of self-improvement through self-confrontation, and one who would not continue taping, there was a relatively large group of those who accepted the idea intellectually but emotionally had difficulties in overcoming anxieties. They were taped several times but while viewing the tape remained very neutral and indifferent toward it; some stopped the tape after awhile, indicating that there was nothing special about it. Scheduling taping sessions with this group has become a problem. Some found many "reasons" why they should not be taped at a certain time. For example, "I do not have time to prepare a good lesson that merits taping," or "the material does not lend itself to taping." In some cases faculty members could not find time to view their tapes, which were then erased since we did not have enough tapes. At

times, there was justification for such delays; however, most of the time these reasons were employed as a rationale to avoid taping or viewing their tape.

In a discussion of resistance to innovations in higher education, Evans[27] describes a kind of pseudo-acceptance of an innovation in which the people involved have ambivalent feelings. Openly they accept it; however, their anxieties and hesitations hamper and even freeze effective implementation of the innovation. It should be strongly emphasized that a positive attitude on the part of the professor does not guarantee readiness for intensive work that can modify behavior.

Faculty members were aware that the administration on all levels, Departmental, College, and University, encouraged this type of activity. Even in the case of a full professor who did not expect promotion, this attitude was an important factor. Some were, however, skeptical about this supportive attitude and indicated that real support must be translated into a reward system.

Favorable student attitudes were also important to the professor's readiness to work. In all cases, taping activities did not disrupt regular class activities. The students were informed of the nature and purpose of the activity and seemed to appreciate the professor's efforts to improve instruction. When the students learned that they, too, were being taped in class during discussion or while presenting papers, they were curious and sometimes anxiously asked to view the tapes. They indicated that much had been learned about their own behavior in the classroom. Viewing a student sleeping during the lecture was a traumatic experience to both students and lecturer.

Modifying Professors' Teaching Behavior

Experience in this study has shown that "authentic" feedback mechanism, systematic analysis of the tape, and the emphasis on acquisition of special skills are instrumental in modifying teaching behavior of faculty on the higher education level. What role should the consultant assume in the process of behavior modification? A synthesis of both the direct and the indirect approach seems most desirable.

The indirect approach is that in which the consultant assumes a role of helping the professor to be more sensitive to the feedback and reinforces him in his efforts to find new styles of teaching. There is ample psychological evidence to support this approach and, in addition, it is assumed that the notion of academic freedom requires a minimization of intervention as far as style of teaching is concerned. It is suggested that every professor find the style with which he is most confortable and perfect it. This notion seems to be less threatening than direct efforts by the consultant. It is also assumed that the professor will tend to persist with the modified behavior that he himself developed. On the other hand, our experience has shown that the indirect approach may create anxieties and frustrations and be very ineffective if the professor is not highly motivated, sensitive enough in the analysis of tape, and knowledgeable about teaching and learning processes.

After seeing the first tape, the professor may be shocked; he awaits the verdict, preferably approval. The most important task of the consultant is to use a direct approach to help the professor to overcome the initial shock by reinforcing the good aspects of his behavior and to help him to become sensitive to classroom interaction.

Later, the professor expects the consultant to give concrete suggestions of styles of teaching and to indicate areas that need modification. The consultant must be sensitive to the professor's frustration tolerance. Excessive indirect efforts in which the consultant insists that the professor find his own way may be discouraging. The professor recognizes the consultant as an expert and expects advice. Moreover, he hopes to have someone share the responsibility of the new style or method in case it is not successful. It is essential, however, that this develop into a "helping relationship." It is necessary to secure an atmosphere in which the professor is not overwhelmed by the consultant's status or knowledge and thus is not liable to accept suggestions without careful examination. It is important, therefore, to arrive at a truly common decision in regard to the next step. It is highly desirable that after every taping session attainable goals be set. The "shock treatment" of the tape may stimulate some professors to pursue radical changes in a short time. Although they may be prepared for it intellectually, they may not be ready on the emotional or behavioral level.

Effective Styles of Teaching

Skeptics among the "observers" in the faculty and some participants tend to doubt if there is a real scientific proof on the effectiveness of certain teaching methods. For example, does switching from a "professor-centered" or "lecture-centered" style to a "student-centered" and "classroom interaction" style improve academic achievement?

In many cases, the educational consultant has difficulties in presenting acceptable scientific proof to engineers or teachers in the sciences about the effectiveness of certain methods, even though there is some quantitative research evidence on certain teaching methods. The main problem is that the professor wants to measure only academic achievements for which certain styles are appropriate. However, higher education also has other objectives than the accumulation of knowledge. For example, it is often stated that the role of higher education is to develop independent thinking, and to have the ability to analyze, interpret, and communicate ideas. These skills are essential to all students.

If one changes his style of teaching from lecture to classroom interaction in order to achieve these goals, he cannot expect to collect evidence with a test designed to examine memory and knowledge of facts. In this case, analysis of tapes of a class before and after treatment can provide a panel of judges with ample information as to whether certain desired changes have occurred in regard to the ability to communicate, analyze, and interpret.

It should be admitted, however, that in some cases the educational consultant is not able to prove, with hard statistical data, that a certain way of using audio-visual aids or asking questions has been more effective. Until such data are available, he will have to rely on intuition and common sense.

The Individual and Group Model

It would seem that both models should be employed with senior and junior faculty. The researchers have not applied the group model to senior faculty members as yet, but after some intensive work with individual professors, it would be possible to group them together for discussion of teaching problems, viewing "models" of teaching styles, and analyzing their own tapes. After gaining confidence and achieving some success in behavior modification, it is hoped that the professor would be ready to share his experiences with others.

The assistants in the group model were relieved, at their request, from group confrontation at mid-semester and worked individually with the researchers. The group model caused pressures among some of them that added to the existing pressure of being under the eyes of the camera in their initial exposure to a teaching career. After a period of "rest," the group sessions were resumed. It should be noted that the academic load of the assistants' graduate work, plus economic and family burdens probably contributed to pressure. The fact that they were among the few in the university engaging in such an activity also contributed to this pressure.

The Intensity of Work

Our experience has shown that significant visible behavior modification occurred with those participants who worked intensively and were ready to invest time and emotional effort. In pursuing such activity in the future, it is essential that the participants commit themselves to a minimum of six tapings during a semester, preferably one each week. Scheduling and logistics should be determined far in advance in order to minimize opportunities for changes in scheduling that are, in many cases, indications of the desire to discontinue taping and analysis. Since intensive work requires a significant amount of time for taping and analysis, it is safe to assume that, with the present conditions, it could not be conducted on a large scale. While few of the faculty would work intensively, opportunities should be given to those who so desire to be exposed to the media and technique.

The Research Team

Taping and analysis of tapes requires a significant amount of time on the part of researchers. During the first pilot study, it was evident that one could not expect faculty members to conduct these activities on free time. It is essential that they be released from other activities to conduct these in-service training programs.

In choosing faculty for this task, it is advisable to identify members of the staff who have an interest in teaching improvement and who will be able to pursue such activities for more than one year. A faculty member conducting such activities must develop sensitivity to the analysis of classroom interaction. He must read and become aware of new research developments in this field and in the area of teaching and learning. Moreover, it takes time before he can gain the confidence of the faculty in the taping and analysis procedure.

One way to encourage faculty members to pursue such activities is to design them as research projects and publish the results in scientific literature. It is essential, however, that these publications, even though in educational research, be recognized as evidence of research contributions by those in charge of rank and pay of the faculty.

Experimenting With Additional Methods

The media and methods explored in this project do not exhaust the possibilities of teaching improvement. It is highly advisable that the potential of new combinations be explored. For example, in the field of teacher education there is experimentation in combining interaction analysis, video-taping, and micro-teaching. In the case of engineering education, interaction analysis, which provides a more accurate written feedback on a matrix, could be a forceful addition to the visual feedback and the interpretation of the consultant.

Relatively inexpensive additions to the taping equipment would enable the class and teacher to be taped at the same time from the front and the back of the classroom. By a split-screen image, the viewer can see more clearly the interaction process and the impact of teacher's and students' activities on each other.

Technical Problems and Logistics

One purpose of the pilot studies was to discover the technical and logistics problems involved in these activities. Experience indicates that there are relatively few technical problems regarding equipment and maintenance. Some taping was done by a crew of professional TV technicians. It was found, however, that there is no objective need for highly skilled manpower. A technically skilled graduate assistant was able to learn very quickly how to assemble and operate the equipment. He was then able to supervise students in pursuing these activities.

The most important aspect of the semi-professional portable equipment is that it is possible to tape in the classroom with minimum disturbance to students and teachers. Because of some noise produced by the particular video recorder used in this experiment, the recording equipment was moved into the hall outside the classroom at times. This required another student helper to operate the camera.

In a similar project conducted by the College of Education, one-half-inch tape equipment was used. A special mobile unit was built that contained all equipment, and one operator could run it from the back of the classroom with minimum disturbance.

The problem of adequate audio feedback, especially of students, is still unsolved. Though the teacher wore a lavaliere microphone, the two standing microphones in front of the classroom were not powerful enough to pick up everything that was said in the classroom. It is important to explore technical solutions to improve the audio feedback.

From the experience in this study and the one conducted in the College of Education, it would seem that one-half-inch tape equipment would produce effective tapes

for feedback purposes. The cost of such equipment is about half that of one-inch equipment. The one-half-inch tapes cost less and they are easier to store.

The high cost of one-inch tapes restricted the number of tapes available for this study. This shortage of tapes caused difficulties and reduced the effectiveness of the study. In some cases the tape of a professor had to be erased without viewing it to enable new taping. It is of utmost importance to keep excerpts of all tapes of each professor in order to examine the pattern of change. They are also very effective in motivating the professor for further improvement.

The length of a lesson to be taped was also related to the number of tapes available. In the micro-teaching technique laboratory, lessons are six to twenty minutes long, which is ample feedback for analysis. Professors, however, at the beginning of the study, asked to be taped for an hour in order to examine the structure of the lesson and subject matter content. They insisted that even for method purposes there was a need to see the whole lesson and not just part of it. After several viewings, they were convinced that for examining methods a short sequence was all that was necessary. They may have been getting tired of examining a whole hour of tape. To increase cooperation, it is important to allow them to decide to tape only excerpts of the lesson.

The planning of logistics for taping and immediate viewing and analysis and the administration of this plan seems to be a major problem. It is highly desirable to coordinate these activities with teaching assignments far in advance in order to obtain optimal results.

Many Ways to Improve the Quality of Teaching in Higher Education

It should be emphasized that micro-teaching techniques and the use of portable video recorders are only a few of the new methods of improving instruction in higher education. They are not a panacea for all problems of the professor. A combination of these techniques with various others, such as systematic observation methods of verbal interaction in the classroom, may be of greater help.

In this project, the researchers have focused on these specific media and techniques, assuming that, by the practicality and reality inherent in them, they have a strong appeal to professors and thus are more likely to be effective in the efforts to improve instruction on the higher education level.

CHAPTER V

TECHNICAL ASPECTS OF VIDEO-TAPING*

The use of media in education is generally considered as a means to an end and is viewed as having a secondary role. In the study, however, the media, portable video recorders, played a major role in achieving the purposes of the study. The feedback process facilitated by the media was essential not only for the analysis of teaching behavior but stimulated the professors' awareness and readiness for change. McLuhan's concept that the "medium is the message" was apparent in the case of this study.

The success of any study on the use of new media in education depends to a great extent on its proper functioning. This is particularly important in activities designed to modify professors' behavior. Technical difficulties which prevent the taping of a highly motivated professor who is ready to confront himself can cause frustration. Recordings of poor quality and distorted images discourage further participation. Adequate attention must be given therefore to assure the proper functioning of the media.

In the following discussion, attention will be given to technical aspects of the project's work including the equipment used, deployment of units, and general logistics of the operation.

Equipment

One	1" Ampex Model VR-7500 Transistorized Video-Tape Recorder	$3,995.00
One	Concord Camera	895.00
One	Sampson Tripod	130.00
One	23" Television Receiver	130.00
One	8" Television Monitor	180.00
One	Steel Cart	35.00
One	Lapel Microphone	85.00
Two	Directional Microphones and Stands	260.00
One	Bogen Mixer	160.00
	Various Assorted Cables and Cords	75.00
One	Cannon Zoom Lense	400.00
Fifteen	1" Ampex Video Tapes @ $65.00	975.00
		$7,320.00

*The material contained in this part of the report is from a paper by Karel Puffer, "Experience in the Operation of the Video-Tape Equipment, Ampex 7500."

Deployment of Equipment in the Classroom

At the start of the project the video-tape recorder and the television camera were both located in the classroom. However, it was found that this setup was very distracting to both the students and the teacher, as this required two technicians and a somewhat noisy recorder to be in the classroom. It was found that having only the camera and cameraman in the room with the other associated equipment in the hall was far superior in the case of this 1" equipment. In other studies 1/2" equipment has been found suitable for direct in-class use with only one operator.

The placement of the camera relative to windows is important so as to minimize reflections off blackboards. Windows, where possible, should be behind or to the side of the camera location. The camera should also be positioned so as to make it possible to view both the students and the professor. The zoom capabilities of the lense should be utilized to capture individual facial expressions where appropriate. Undergraduate students were found to be entirely competent to act as cameramen.

In addition to the lapel microphone worn by the professor, two directional floor microphones were used in order to pick up student questions and responses. Proper operation of the mixer requires practice and thus cannot be done by anyone without experience. Achieving good sound reproduction from all students in a class of any size is at best very difficult.

Operation of the video recorder can be accomplished by most anyone. The total crew for most any operation would consist of a cameraman and a technician who operates the recorder and mixer.

Recorder Portability

It is important to have the recorder mounted on a movable cart so as to be able to move the unit from one classroom to another with the minimum of effort. The camera unit and tripod should be equipped with wheels. Even with these aids, setup time for the units was approximately fifteen minutes. This resulted in very little back-to-back scheduling of taping.

Viewing of Playback

There should be a room where the tapes may be viewed privately without interruption, as some staff members would feel threatened if people other than the research team were to see the tapes.

Video Recording Logistics

The logistics of a large scale taping program can be very complicated. All persons involved in the program had to be aware when the equipment was scheduled to be used. This was accomplished by putting out a monthly schedule to all participants. Those individuals directly involved in a taping initiated and returned a form indicating that they were aware of an impending taping. This minimized the number of times where a member of the crew did not show up for the taping.

An adequate number of tapes should be available so that parts of tapes can be saved for future use. It is suggested that there be a minimum of two tapes per person in order to insure adequate footage so as to have a permanent record of any progress made. At the first of the program, entire lectures were taped, but later short five-minute excerpts were taped instead. This was done to conserve tape and it proved to be completely adequate for analysis purposes as has been shown in the micro-teaching concept.

Pre-Taping Procedures

It was discovered that it is good practice to clean the "head" of the recorder prior to every taping or playback. If there is no picture on the monitor during recording or playback first check to see that the recorder is properly threaded. If it is, then clean the head. These procedures will take care of 75% of the malfunctions. Prior to a taping, run a few feet of a trial run (10-20 feet) and then play back in order to be sure the equipment is recording both the video and audio. This procedure prevented many disappointments and should be adopted as standard warming up procedures.

Additional Comments

Taping of a class while the instructor is using an overhead projector, surprisingly, worked quite well and resulted in a tape that was of high visual quality. Good complete records of content of each tape is of paramount importance, since with the passage of time no one will remember all the details.

A split screen capability is now offered by some manufacturers, where half the screen shows the picture from one camera and the remainder of the screen from the second camera. This enables one to have both the teacher and his class all on one monitor at one time. This may increase the understanding of student and teacher behavior.

CONCLUSIONS AND RECOMMENDATIONS

General Attitudes

Faculty members and participants in the project responded favorably to the use of video recordings and micro-teaching techniques to improve instruction. Several of them indicated readiness to pursue with more intensive work in this area in the future.

The video recordings provided an authentic feedback of classroom interaction and the micro-teaching technique provided a systematic method for analysis of these tapes and the aquisition of new teaching skills. The authenticity, practicality, and effectiveness of the media and technique were instrumental in perpetuating the favorable attitudes and in modifying classroom teaching styles. Teachers were highly motivated to pursue these activities when observing these modifications and their impact on classroom interaction via tapes.

A "ripple effect" was achieved due to the project work; participants showed greater awareness of teaching problems and increased motivation to engage in other activities designed to improve teaching on the higher education level. The supportive climate in the department toward activities aimed to improve instruction was very instrumental in creating a favorable attitude among the faculty toward the project.

Recommendation 1: In view of the favorable attitudes in the Department of General Engineering toward the use of video recordings and micro-teaching techniques, it is recommended that the present project be extended and expanded.

Reducing Anxieties of Self-Confrontation

The use of video recordings may be perceived as a threat to a teacher's personal integrity and an invasion of his academic freedom. A confidential, permissive, non-threatening atmosphere was established between researchers and participants and this proved essential in helping participants overcome initial anxieties of self-confrontation on tape. Assurances that no administrative use would be made of the recordings were also instrumental in achieving cooperation.

Recommendation 2: It is recommended that every necessary step be taken by the department and the researchers to assure faculty that no administrative use would be made of tapes without their consent.

Coordination of Activities

Difficulties in coordinating taping activities and the immediate analysis of tapes occurred quite often. This seemed to reduce some of the project effectiveness.

Recommendation 3: It is recommended that faculty members who intend to participate intensively in future activities should be identified before the beginning of the semester. Every effort should be made to coordinate their teaching and other assignments with taping activities in order to enable review and analysis of tapes immediately following taping.

Structured Research

Being a pilot study, one of its purposes was to identify problems in conducting a more structured research project which would enable quantitative evaluations.

Recommendation 4: It is recommended that the Office of Instructional Resources and the College of Education cooperate with the department in structuring activities in this area and in pursuing a quantitative evaluation of their results. Special attention should be given to experimentation with additional feedback methods such as "interaction analysis" which might appeal especially to engineering and science faculties.

Utilizing Video Recordings in Other Activities

While video recording equipment was available in the department, it was used for other purposes such as providing senior students with feedback and an analysis of their seminar presentation. Taping of teachers who are enrolled in the Academic Year Institute conducted by the Department of General Engineering was also made in order to acquaint them with the equipment and the potentials of the media.

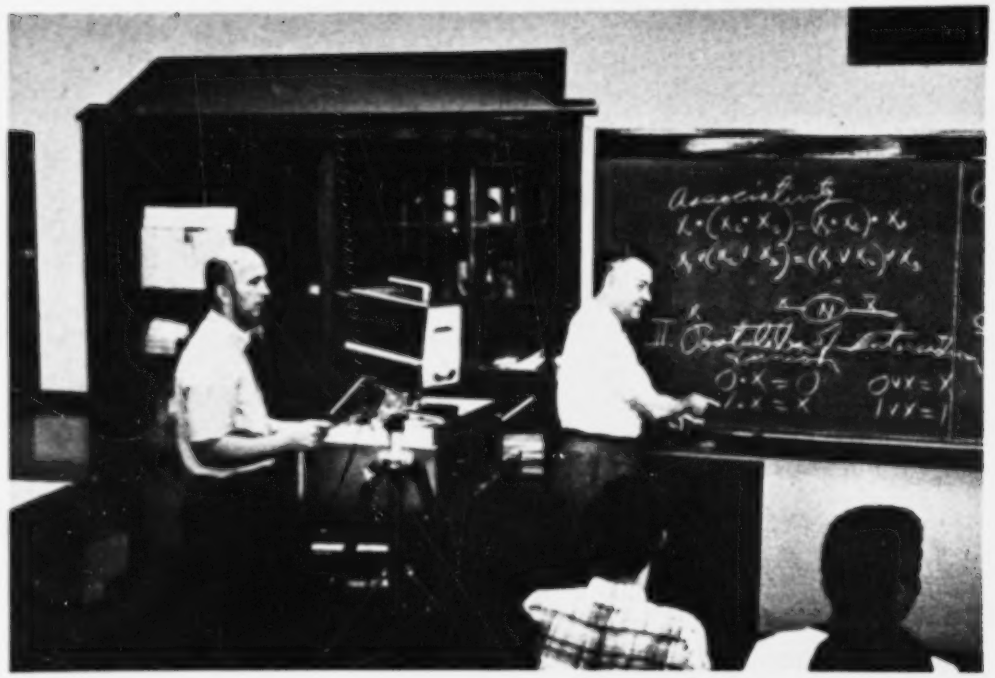
Recommendation 5: Since video-taping equipment will be available in the department, it is recommended to explore some other uses of this media as instructional aids.

Operation, Maintenance and Size of Equipment

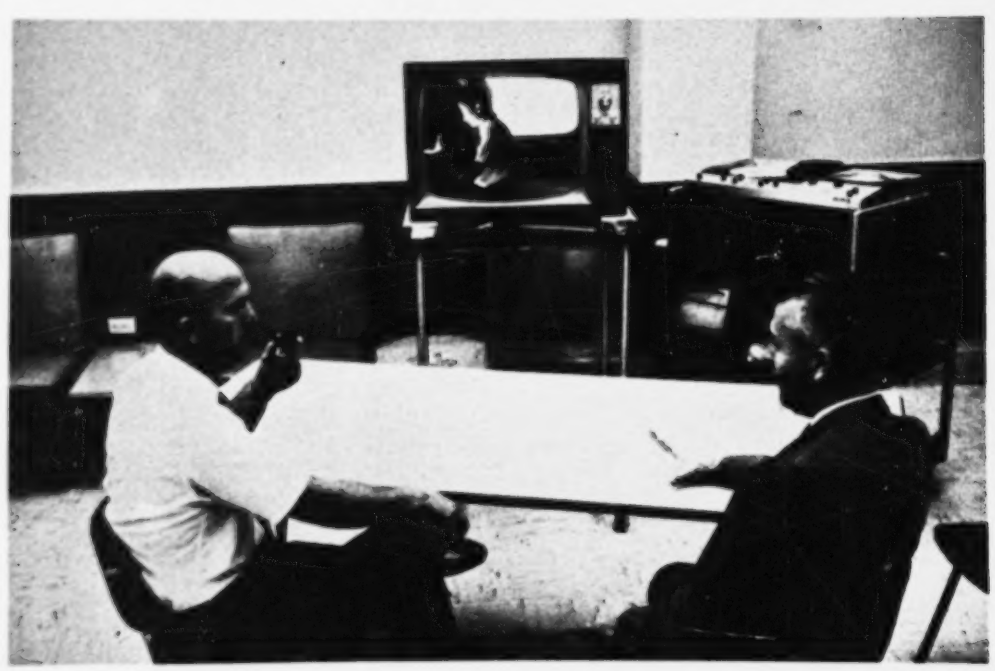
While the one-inch equipment used in the project is somewhat large and bulky, it performed well, after initial debugging, and gave an excellent picture from which several tapes were dubbed.

The equipment was set up, operated, and daily maintenance was performed by graduate and undergraduate students. No malfunctions that occurred could be traced to operator error.

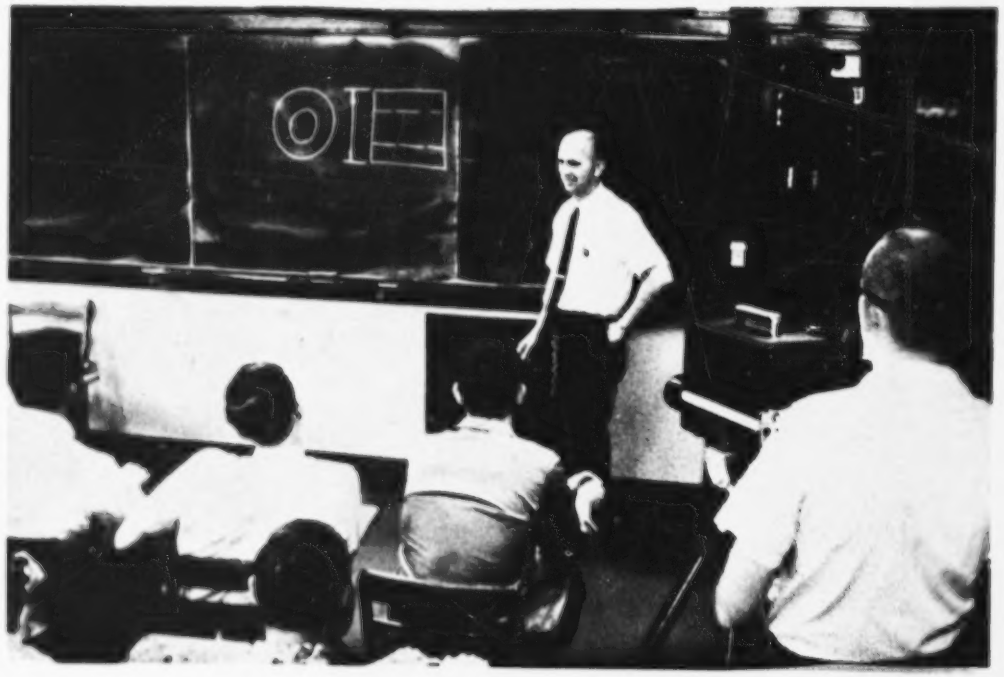
Recommendation 6: The continued use of one-inch equipment, unless a high degree of portability is required, is recommended. In that case, half-inch equipment which is much more compact and is adequate except where the highest quality picture is needed is recommended. If the cost of the system is a major consideration then the purchase of two half-inch units would be preferred to the purchase of a one-inch unit.



TAPING PROFESSORS OF ADVANCED COURSES IN CLASSROOM SITUATIONS - INDIVIDUAL MODEL.



RESEARCH TEAM MEMBERS AND PROFESSORS IN EVALUATIVE DISCUSSIONS.



TAPING SESSION OF INSTRUCTOR-STUDENT INTERACTION DURING PILOT STUDY.

RESEARCH TEAM AND EDUCATIONAL CONSULTANT EVALUATING IMPROVEMENT OF TEACHING ASSISTANTS.

APPENDIX B

VIDEO-TAPING SCHEDULE
Department of General Engineering

First Semester 1967-68

Date	Time	Person Taped
Sept. 20	8:00	Meyers
20	1:00	Mass
20	3:00	Groszczyk
Minor Machine Breakdown		
Sept. 27	8:00	Meyers
27	1:00	Mass
27	3:00	Groszczyk
28	8:00	Danner
28	10:00	Boichot
29	11:00	Jewett
Major Machine Breakdown		
Oct. 19	8:00	Danner
20	8:00	Martin
20	11:00	Jewett
20	3:00	Miller
27	11:00	Jewett
27	8:00	O'Bryant
30	8:00	O'Bryant
30	11:00	Jewett
Nov. 1	8:00	Meyers
1	1:00	Mass
1	3:00	Groszczyk
2	8:00	Danner
2	10:00	Boichot
3	8:00	O'Bryant
6	8:00	Martin
15	11:00	Jewett
15	3:00	Dobrovolny
16	5:00	Danner
20	11:00	Jewett
20	1:00	Danner
21	8:00	Danner
21	10:00	Danner
28	11:00	Jewett
29	3:00	Dobrovolny
30	5:00	Mass
30	7:00	Jewett
Dec. 1	8:00	Wilson
4	1:00	Mass
5	3:00	Dobrovolny
6	3:00	Dobrovolny
7	5:00	Boichot
12	8:00	Boichot
13	10:00	Dobrovolny
13	3:00	Dobrovolny
14	5:00	Meyers
20	3:00	Dobrovolny
20	8:00	Meyers
21	5:00	Research Team
Jan. 3	3:00	Dobrovolny
4	5:00	Research Team
10	3:00	Dobrovolny
11	5:00	Research Team

Second Semester 1967-68

Date	Time	Person Taped
Feb. 23	1:00	Larson
26	10:00	Phillips
28	1:00	Schlafer
29	10:00	Hannon
Mar. 1	1:00	Larson
1	3:00	Hindhede
6	8:00	Scheinman
8	10:00	Martin
12	9:00	Martin
13	10:00	Martin
29	1:00	Larson
Apr. 3	1:00	Larson
3	3:00	Dobrovolny
4	10:00	Hannon
5	1:00	Schlafer
17	10:00	Phillips
17	3:00	Dobrovolny
19	8:00	Wilson
22	10:00	Martin
22	2:00	O'Bryant
24	11:00	Martin
24	1:00	Larson
24	3:00	Dobrovolny
26	2:00	O'Bryant
29	2:00	O'Bryant
May 1	1:00	Larson
1	3:00	Dobrovolny
6	2:00	O'Bryant
8	3:00	Dobrovolny
10	2:00	O'Bryant
13	2:00	O'Bryant
15	3:00	Dobrovolny
17	2:00	O'Bryant
21	1:00	Berkow

Note: It should be noted that the above list includes only the scheduled tapings and does not include private or group viewing of the tapes after their being made.

FOOTNOTES

[1]Bleger, Theodore C. and Cooper, Russell M. (eds.) The Preparation of Teachers. Washington, D. C.: American Council on Education, 1950, p. 123.

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[3]Lancaster, Otis E. "ASEE-Penn State Summer Institutes on Effective Teaching for Engineering Teachers," loc. cit., p. 127.

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[5]Nevill, Gale E., Jr. and Eisenbell, Martin A. "Motivating Better Teaching," loc. cit., p. 106.

[6]Lee, Calvin B. T. Improving College Teaching. Washington, D. C.: American Council on Education, 1967.

[7]Wilson, Meredith O. "Teach Me and I Will Hold My Tongue," Lee, Calvin, op. cit., p. 9.

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[9]Jencks, Christopher and *Riesman, David*. The Academic Revolution. New York: Doubleday and Company, Inc., 1968, p. 531.

[10]Lewin, Kurt "Conduct Knowledge and Acceptance of New Values," Resolving Social Conflicts. New York: Harper and Brothers, 1948, p. 59.

[11]Ibid, p. 63.

[12]Goheen, Robert F. "The Teacher in the University," American Scientist, Vol. 54, No. 2, 1966.

[13]Verdium, John R. Conceptual Models in Teacher Education. Washington, D. C.: The American Association of Colleges for Teacher Education, 1967.

[14]Miel, Alice Changing the Curriculum - A Social Process. New York: Appleton-Century-Crofts, Inc., 1946, p. 40.

[15]Sharp, George Curriculum Development as Re-Education of the Teacher. New York: Bureau of Publications, Teachers College, Columbia University, 1951.

[16]McKeachie, W. J. "Research in Teaching: The Gap Between Theory and Practice," Lee, Calvin, op. cit., p. 211.

[17]Pomeroy, E. C. in the introduction to Schueler, H., Lesser, C. S. and Bobbins, A. L. Teacher Education and the New Media. Washington, D. C.: American Association of Colleges for Teacher Education, 1967.

[18]Medley, D. M. and Mitzel, H. E. "Measuring Classroom Behavior by Systematic Observation," N. L. Gage, (ed.) Handbook of Research on Teaching. Chicago: Rand McNally and Company, 1963.

[19]Nielsen, Gerhard Studies in Self-Confrontation. Copenhagen, Denmark: Munksgaard, 1962.

[20]Schueler, H., Lesser, C. S., and Bobbins, A. L. Teacher Education and the New Media. Washington, D. C.: American Association of Colleges for Teacher Education, 1967.

[21]As reported at the 1967 and 1968 A.E.R.A. conventions.

[22]The term "micro-teaching" was coined by Dwight Allen of the Stanford University teacher-education program while he was pioneering in the application of the system to teacher education.

[23]Allen, D. W. Micro-Teaching: A Description. Stanford, California: Stanford University, School of Education, 1966.

[24]Amidon, E. and Rosenshine, B. "Interaction Analysis and Micro-Teaching in an Urban Teacher Education Program," Philadelphia: Temple University. (Unpublished paper presented at 1968 A.E.R.A. convention.)

[25]Allen, D. W. "Micro-Teaching: A New Framework for In-Service Education." (Unpublished mimeographed paper.)

[26]Miles, M. B. (ed.) Innovations in Education. New York: Bureau of Publications, Teachers College, Columbia University, 1964, p. 638.

[27]Evans, Richard I. and Leppman, K. Resistance to Innovation in Higher Education. San Francisco: Jossey-Bass, Inc., 1967. Evans has an extensive bibliography on the problem of introducing innovation.